

2 I claim:

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4 1. An apparatus for separating impurities from a stream comprising:

5 -a rotor cone cap having an inner portion and an outer portion, said rotor cone cap

6 comprising:

7 an inlet for the stream;

8 -a rotor bowl having an inner portion and an outer portion, said rotor bowl being

9 connected to said rotor cone cap, and wherein said rotor bowl comprises:

10 -an array of cavities operatively arranged to receive the stream from said impeller

11 vane;

12 -a membrane, operatively positioned within said array of cavities, for separating

13 the impurities from the stream;

14 -a permeate outlet for delivering a permeate from the rotor bowl;

15 -drive means, operatively connected to said rotor bowl, for rotating the rotor bowl so that

16 the stream is exposed to a centrifugal force.

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18 2. The apparatus of claim 1 wherein the rotor cone cap contains a baffle plate to distribute the
19 stream about the inner portion.

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21 3. The apparatus of claim 2 wherein said rotor bowl contains an impeller vane arranged on the
22 inner portion of said rotor bowl, wherein said impeller vane is adapted to receive the stream.

1 4. The apparatus of claim 3 wherein said membrane comprises:

2 -a spiral wound membrane cartridge adapted to fit within said cavities.

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4 5. The apparatus of claim 4 wherein said rotor bowl contains a retentate outlet for delivering the
5 retentate from the rotor bowl.

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7 6. The apparatus of claim 5 wherein the array of cavities is orientated at an angle between 10
8 degrees and 60 degrees relative to a horizontal axis of the rotor cone.

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10 7. The apparatus of claim 6 wherein said retentate outlet contains a back pressure valve for
11 regulating the pressure within the retentate outlet.

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13 8. The apparatus of claim 7 wherein said permeate outlet is directed to the outer portion of said
14 rotor bowl so that the permeate is directed radially outward.

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16 9. The apparatus of claim 8 wherein the retentate outlet is directed to an inner chamber located
17 radially inward from said array of cavities so that the retentate is directed radially inward.

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19 10. The apparatus of claim 9 wherein said spiral wound membrane cartridge comprises: a thin
20 film composite material.

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22 11. A filtration apparatus for filtering a stream comprising:

1 -a rotor member having an inner portion and an outer portion, said rotor member
2 comprising:
3 -an inlet for the stream;
4 -an array of cavities operatively arranged to receive the stream from said impeller
5 said array of cavities being arranged at a angle of between 60 degrees and 10
6 degrees relative to a horizontal axis of the rotor member;
7 -means, operatively positioned within said array of cavities, for separating the
8 impurities from the stream;
9 -a permeate outlet for delivering a permeate from the rotor member;
10 -drive means, operatively connected to said rotor member, for rotating the rotor member
11 so that the stream is exposed to a centrifugal force.

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13 12. The apparatus of claim 11 wherein the rotor member contains a baffle plate to distribute the
14 stream about the inner portion.

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16 13. The apparatus of claim 12 wherein said rotor member contains an impeller vane arranged on
17 the inner portion of said rotor bowl, wherein said impeller vane is adapted to receive the stream
18 from the baffle plate.

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20 14. The apparatus of claim 13 wherein said separating means comprises:
21 -a spiral wound membrane cartridge adapted to fit within said cavities.

1 15. The apparatus of claim 14 wherein said rotor member contains a retentate outlet for
2 delivering the retentate from the rotor member.

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4 16. The apparatus of claim 15 wherein said retentate outlet contains a back pressure choke for
5 regulating the pressure within said retentate outlet.

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7 17. The apparatus of claim 16 wherein said permeate outlet is directed to the outer portion of
8 said rotor bowl so that the permeate is directed radially outward.

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10 18. The apparatus of claim 17 wherein the retentate outlet is directed to an inner chamber located
11 radially inward from said array of cavities so that the retentate is directed radially inward.

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13 19. The apparatus of 14 wherein said spiral wound membrane cartridge comprises: a cellulose
14 acetate membrane.

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16 20. The apparatus of claim 15 wherein the array of cavities is orientated at a angle between 50
17 degrees and 30 degrees relative to the horizontal axis of the rotor member

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19 21. A method of separating an affluent comprising:
20 -providing a rotor apparatus, said rotor apparatus comprising a rotor member having an
21 inner portion and an outer portion, said rotor member including an inlet for the stream; an array of
22 cavities operatively arranged on the outer periphery of the rotor apparatus and adapted to receive

1 the affluent; a membrane, positioned within said array of cavities, for separating the impurities
2 from the affluent; a permeate outlet for delivering a permeate from the rotor apparatus; and, a
3 retentate outlet for delivering a retentate from the rotor apparatus;

4 -flowing the affluent to the inlet of the rotor apparatus;

5 -rotating the rotor apparatus;

6 -creating a centrifugal force within the inner portion of the rotor apparatus so that the
7 affluent is forced to the outer periphery of the rotor apparatus;

8 -directing the affluent to the array of membranes arranged on the outer periphery of the
9 rotor apparatus;

10 -separating the affluent in the array of membranes into the permeate and the retentate;

11 -producing the permeate from the rotor apparatus via the permeate outlet;

12 -producing the retentate from the rotor apparatus via the retentate outlet.

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14 22. The method of claim 21 wherein the step of directing the affluent to the array of membranes
15 includes channeling the affluent about a baffle arranged within the inner portion of the rotor
16 apparatus.

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18 23. The method of claim 21 wherein the step of directing the affluent to the array of membranes
19 includes channeling the affluent to a plurality of impeller vanes arranged on the inner portion of
20 the rotor apparatus.

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22 24. The method of claim 23 wherein said permeate outlet is directed to the outer portion of said

1 rotor apparatus and wherein the step of producing the permeate includes directing the permeate
2 radially outward.

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4 25. The method of claim 24 wherein the step of producing the retentate from the rotor apparatus
5 includes directing the retentate to an inner chamber located radially inward from said array of
6 membranes so that the retentate is directed radially inward.

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8 26. The method of claim 25 wherein the producing the retentate from the rotor apparatus
9 includes controlling the back pressure within the retentate outlet.

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